

The Petroleum Systems of the San Joaquin Basin: Using a Sequence Stratigraphic Framework to Describe the Origin of Hydrocarbon Accumulations in a Structurally Active Basin

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A regional sequence analysis of the Late Cretaceous to Recent basin fill provides a robust stratigraphic framework with which to understand and predict the distribution of source rocks, seals, and reservoirs in the San Joaquin basin. Based on a comparison of oils derived from fields and extracts from source rocks, two principal sources are confirmed: the Eocene Kreyenhagen Formation and the Miocene Monterey Formation. Kreyenhagen oils are confined to Cretaceous through Miocene pools in fields in the central San Joaquin basin and to a few pools in the Cymric and Belgian Anticline area. Monterey oils are found throughout the southern part of the basin within reservoirs of Oligocene to Pleistocene age.

The main period of oil generation and expulsion from Kreyenhagen and Monterey source rocks occurred during the Pliocene and Pleistocene at a time when most of the structural traps within the basin were forming. The Eocene lowstand Point of Rocks submarine fan did not play a significant role in charging Coalinga-area fields. Instead, primary migration conduits were through Eocene and Miocene transgressive system tracts into highstand shelf sand bodies. In contrast, a complex Miocene lowstand turbidite network is interbedded with the Monterey source and is continuous updip to several points near the shelf edge. Monterey oil is effectively expelled and transmitted from the source rock through the turbidite network to highstand sand bodies located at the basin's margins. Older traps, such as those along the eastern edge of the basin, may have been charged by early maturity oils; whereas later formed traps, such as Elk Hills, may have received oil from medium maturity oils, reflecting a subtle interplay between timing of trap formation and evolving kitchen areas.

The paucity of significant oil or gas generated from more deeply buried pre-Miocene source rocks in the southern part of the basin may be a result of the deterioration of source quality to the south and that the source interval reached maturity, with expulsion of hydrocarbons prior to trap formation. Less likely, seals for deeper source intervals are highly effective and prevent migration into younger reservoirs. Late Cretaceous and Paleocene source rocks are thought to be absent in the southern basin due to an early Eocene erosional event.